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PRE-IMPOUNDMENT BIOLOGICAL SURVEY OF STOCKTON RESERVOIR-SAC REVER, MISSOURI, AUGUST, 1968

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Federal Water Pollution Control Administration
Cincinnati, Ohio

1969

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The purpose of the investigation was to obtain information on the aquatic communities inhabiting the reservoir site & downstream waters. The data obtained are used to predict biological changes that may occur in the reservoir, and for future evaluation of changes in the aquatic life within and downstream from the reservoir after impoundment

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August 1968

by

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At the request of the Army Corps of Engineers through the Missouri Basin Region, Federal Water Pollution Control Administration, a pre-impoundment biological survey was conducted August 26-27, 1968, from South Greenfield to Stockton, Missouri, on the Sac River and Stockton Reservoir, an impoundment site on the Sac River (Figure 1). The purpose of the investigation was to obtain information on the aquatic communities inhabiting the reservoir site and downstream waters. The data obtained are used to predict biological changes that may occur in the reservoir, and for future evaluation of changes in the aquatic life within and downstream from the reservoir after impoundment.

The streams of the Sac River and Little Sac River basins have rock covered bottoms and swift stream velocities that produce much riffle habitat. This habitat provides the basis for diverse populations of bottom animals. Water quality is another factor affecting the diversity and magnitude of the community of bottom animals.

As indicated by the populations of bottom animals, water quality was satisfactory in the headwater reaches. The populations inhabiting these reaches were at least 50 percent pollution-sensitive organisms such as stoneflies, mayflies and caddisflies (Table 1). Slight

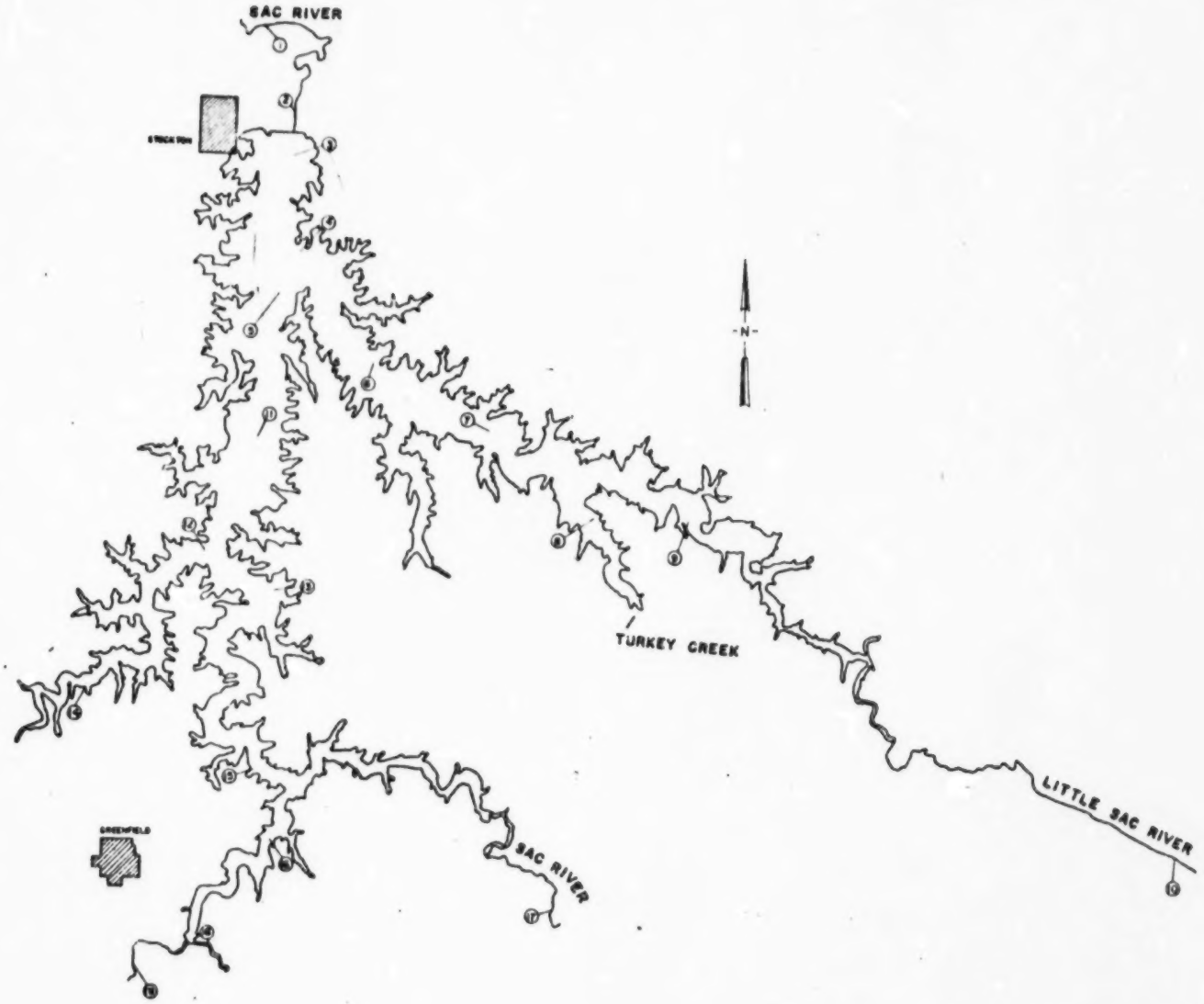

FIGURE 1. LOCATION OF SAMPLING STATIONS ON THE SAC RIVER AND STOCKTON RESERVOIR, MISSOURI.

organic enrichment existed in Turkey Creek. Here pollution tolerant sludgeworms made up 27 percent of the bottom animals. Turkey Creek (Station 8) is classified enriched rather than degraded because it supported the largest population (426 organisms per square foot) of pollution-sensitive bottom animals.

The reach of the Little Sac River that will be inundated (Station 6) supported a population of bottom animals usually found in an unpolluted environment. The population of 392 organisms per square foot was comprised of 95 percent pollution-sensitive bottom animals.

The reach of the Sac River at Station 13 has stream characteristics that reflect conditions similar to a river after it has been inundated. Here reduced stream velocities resulted in the settling of silt that covered the rock substrate. Burrowing mayflies numbering 19 per square foot predominated the population of pollution-sensitive animals. Based on the population of bottom animals inhabiting the slack water reaches, Stockton Reservoir probably will support a population of bottom animals predominated by preferred fish food organisms such as burrowing mayflies and phantom midges.

Downstream from Stockton Dam, the Sac River is a series of long pools that have fine silt substrates. The number of bottom animals increased from 26 to 387 organisms per square foot and from 9 to 11 kinds in the 5-mile reach downstream from Stockton Dam (Stations 2 and 1). Pollution-sensitive forms made up 39 and 52 percent of the population of bottom animals one-half mile (Station 2) and 5 miles (Station 1) downstream from the dam, respectively. Pollution-tolerant forms made up 46 and 42 percent of the population at Stations 2 and 1, respectively. The presence of the large number of pollution-sensitive burrowing mayflies (200 per square foot at Station 1) and the presence of other sensitive forms in this reach indicates that the environment is organically enriched but not severely degraded.

Rivers of the Sac basin support large populations of burrowing mayflies that will serve as a source to populate the inundated soils of Stockton Reservoir. It is also expected that low dissolved oxygen concentrations will occur in the deeper waters of the reservoir during the first two years of impoundment, at least until the oxygen consumption of the organic materials in the inundated soils has been satisfied. If low concentrations of dissolved oxygen in the bottom

waters are severe, the development of the population of burrowing mayflies in the reservoir will be delayed about two years.

Algal nuisances might develop in Stockton Reservoir because all the water flowing into the reservoir site contains in excess of 90 µg/l of total phosphorus. This is almost double the 50 µg/l influent level suggested by Mackenthun[1] for the prevention of algal nuisances in reservoirs. The algal nutrient concentration was particularly high in the Little Sac River (Station 10) where the concentrations of inorganic nitrogen and total phosphorus were 1.7 mg/l and 560 µg/l, respectively. The effects of the algal nutrients from the Northwest Sewage Treatment Plant, Springfield, Missouri, should be determined because this plant is located only 10 miles upstream.

In summary, the streams that will feed Stockton Reservoir are unpolluted by organic wastes. However, they contain high concentrations of phosphorus that might produce algal nuisances. The population of bottom animals downstream will probably improve as the result of the higher quality of the water that will be discharged from the reservoir.

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(1) Mackenthun, K. M. The Phosphorus Problem. Jour. American Water Works Assn., Vol. 60, No. 9, pg. 1047, 1968.

Table 1. Shasta Reservoir, Sac River--Missouri, August 1968

Phytoplankton and Chemical Data

Organisms	S-1	S-2	S-4	S-6	S-9	S-10	S-11	S-13	S-14	S-15	S-17	S-18	S-19
Pyrrophyta													
Peridinium sp.	-	-	18	14	37	3	-	-	2	1	-	-	3
Gymnodinium sp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified sp.	-	-	-	-		-	-	-	-	-	-	-	-
Euglena													
Euglena	-	-	3	-	3	-	-	-	-	-	-	-	-
Phacus sp.	-	-	12	12	18	18	3	-	-	8	6	3	-
Trachelomonas sp.	-	-	7	264	12	156	3	-	12	17	18	14	10
Unidentified sp.	-	-	-	-	-	-	15	-	6	2	-	-	-
Chlorella sp.	-	-	-	-	-	-	2	-	-	-	10	2	-
Trachelomonas sp.	-	-	6	-	-	-	-	-	-	-	-	-	-
Unidentified sp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified sp.	-	-	3	30	21	2	-	12	-	16	-	-	-
Euglena sp.	-	-	-	72	12	16	2	-	-	7	6	2	2
Unidentified sp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified sp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified sp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified sp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified sp.	-	-	-	-	-	-	2	-	-	2	-	-	-
Unidentified sp.	300	12	-	-	-	-	-	-	-	-	-	-	-
Cyanophyta													
Chroococcales sp.	-	+	70	32	7	-	-	-	16	10	3	10	7
Hydrococcales sp.	-	+	3	-	+	7	-	-	+	-	2	-	-
Chlorura sp.	-	-	+	-	-	-	-	-	-	-	-	-	-
Holocystis sp.	-	-	-	-	1	-	-	-	12	-	-	-	-
Leptocercus sp.	-	-	-	-	-	-	-	-	-	-	+	-	-
Lyngbyatoma sp.	-	-	-	-	-	-	-	-	-	1	+	-	-
Diatoms													
Diatoms	-	-	+	-	-	-	-	-	2	1	-	+	-
Desmids													
Gallionella sp.	-	-	-	2	-	-	-	-	-	-	-	-	-
Staurastrum sp.	-	-	151	17	16	9	41	-	-	-	15	-	15
Pleurotaenium sp.	-	-	-	-	3	15	2	-	-	2	2	-	-
Closterium sp.	-	-	-	-	-	18	-	-	-	-	-	-	-
Cosmarium sp.	-	-	-	-	-	-	-	-	-	-	2	-	18
Chlorophyta													
Chlorella sp.	-	+	7	-	3	-	+	-	2	-	2	+	-
Dictyosphaerium sp.	-	-	-	-	-	-	+	-	2	-	+	-	2
Unidentified sp.	-	-	-	-	-	-	-	-	-	-	-	18	-
Cryptophyta													
Rhodomonas sp.	-	-	-	2	-	-	-	-	2	-	-	2	4
Cryptomonas sp.	-	-	-	-	-	-	-	-	+	-	-	-	-
Euglenophyta													
Unidentified sp.	-	-	-	-	-	-	-	-	-	-	-	+	-
Ciliate Protozoa													
Unidentified sp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Insecta													
Unidentified sp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Algae													
Spirotaenia sp.	+	+	+	-	3	-	-	-	+	-	1	-	-
Polypedilum sp.	2	-	+	7	-	-	-	-	3	-	-	+	3
Chironomus sp.	+	+	+	3	-	-	-	-	-	-	-	-	-
Tanytarsus sp.	-	4	3	3	-	-	-	-	-	2	-	-	-
Cryptochironomus sp.	2	-	-	-	-	-	-	-	-	-	-	-	-
Pentaneura sp.	16	-	-	-	-	-	-	-	-	-	-	-	-
Anatopynia sp.	-	-	-	-	-	-	-	-	-	2	-	-	2
Microtendipes sp.	-	-	-	3	-	-	-	2	-	-	-	-	-
Tanypus sp.	-	-	-	-	-	-	2	-	-	-	-	-	2
Annelida													
Cosmarus sp.	-	-	-	-	-	-	-	-	-	-	-	-	2
Sow Bugs													
Lirceus sp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Asellus sp.	-	-	-	-	-	-	-	-	-	-	-	-	1
Limpets	-	-	-	-	-	-	-	-	-	-	17	-	-
Planaria	-	-	-	-	-	-	-	-	+	-	-	-	1
Clams													
Sphaeriidae	-	-	-	-	-	-	2	2	+	-	-	-	-
Anodonta sp.	-	-	1	-	2	-	2	2	+	-	-	-	-
Snails													
Lymnaea sp.	12	2	-	-	-	-	+	-	-	2	-	-	18
Physa sp.	-	-	-	+	-	-	-	2	2	-	-	-	-
Limnea sp.	-	-	18	+	26	2	12	2	+	+	-	2	28
Nematodes													
Unidentified	+	-	-	-	-	-	-	-	-	-	-	-	-
Leeches	-	-	-	-	-	-	+	-	-	-	-	2	-
Nauplius	-	-	-	-	-	-	-	-	-	-	-	2	-
Unidentified	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Kinds	138	86	2	165	2	16	44	27	38	36	16	29	12
Total Number/Sq. Ft.	11	2	12	16	16	12	17	10	28	16	20	17	19
Number of Algae/ml	387	96	398	807	172	311	138	73	144	178	136	134	157
Chemical Data - mg/l	1350	1012	350	435	1580	738	730	776	1064	1527	975	895	788
SiO_2	0.7	0.9	0.3		0.6	1.6	1.1	1.2	0.3	1.0	1.2	0.9	1.3
Fe_2O_3	0.02	0.05	0.09		0.11	0.10	0.06	0.02	0.02	0.09	0.05	0.05	0.05
Org. N	0.3	0.3	0.3		0.3	0.6	0.2	0.2	0.3	0.7	0.3	0.2	0.3
ug/l													
Soluble P	30	20	40	30	20	200	20	20	20	40	20	40	40
Total P	80	70	50		130	360	80	60	60	50	50	120	-

*Collected in qualitative samples only, counted as one in totals.

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